Redox-Switchable Molecular Shuttles

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In a rotaxane in which a benzylic amide macrocycle is locked onto a molecular thread containing two potential H-bond acceptors, a naphthalimide group and a succinic site, the macrocycle resides preferentially onto the latter unit. The reduction of the naphthalimide group brings about the fast shuttling of the macrocycle along the C12- thread down to the naphthalimide unit. The shuttling is then reversed upon the naphthalamide re-oxidation. Very recently, we have shown that such a submolecular translational process, reminescent of the way a piston moves within a cylinder, is triggered by the use of a photon and of a suitable electron donor [1]. We show herein that the same intramolecular dynamics can be put into action by the reversible transfer of one electron at the electrode, during fast scan rate cyclic voltammetry experiments.

[1] A. M. Brouwer, C. Frochot, F. G. Gatti, D. A. Leigh, L. Mottier, F. Paolucci, S. Roffia, G. W. H. Wurpel, Science, 2001, 291, 2124-2128.